

SOV/110-58-12-20/22

An All-Union Conference on Electro-Painting and Radiant-Heat
Drying of Parts in Engineering

erection and testing of an experimental installation for electro-lacquering of galoshes. Engineer M.G.Belokon' reported experimental work on electrostatic painting of wood. Doctor of Physical and Mathematical Sciences Ye.M.Balabanov explained the physical basis of electrostatic painting. Doctor of Technical Sciences P.D.Iebedev described the physical basis and methods of heat exchange in radiant-heat drying. Engineer Ye.N.Vladychina showed how the best conditions of electrostatic painting may be determined: she gave the results of a study of methods of painting products with sharp edges that form positive corona. Engineer M.A.Slutskaia described electrostatic painting and Engineer A.P.Alekseyev compared the different methods. Engineer A.M.Fradkin reported on the technique as applied to painting electric motors and Engineer L.I.Rozno recounted its use in an automobile works. Similar reports on production experience were given by Engineer V.P.Utkin (tractor engine manufacture), by Engineer M.B.Kravchenko (bicycle manufacture) and

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An All-Union Conference on Electro-Painting and Radiant-Heat
Drying of Parts in Engineering

Candidate of Chemical Sciences L.Yu.Kurtts (small instrument parts). Engineers M.I. Tsirlin and V.Z.Gurevich reported their experience with radiant-heat drying of paint. Engineer A.G.Ryakin described the successful operation of a complex conveyor line for electrostatic painting of agricultural machine parts with subsequent radiant-heat drying. Engineers M.N.Livshits and G.S.Nezhinskaya gave further accounts of the electrostatic technique. At the conference a number of recommendations were made about technical and organisational measures that could be used to extend electrostatic painting and radiant-heat drying.

Card 3/3

FRADKIN, A.M.

Mechanization and automation of painting and impregnation and
drying sections in electric machinery manufacture. Lakokras.mat.
i ikh prim. no.2:62-65 '62. (MIRA 15:5)
(Electric machinery industry)(Paint machinery) (Automatic control)

FRADKIN, A. YE., Engineer

"Effect of Temperature Conditions of Baking High-Voltage Porcelain on Its Mechanical and Dielectric Properties." Thesis for degree of Cand. Technical Sci. Sub 22 May 50, Moscow Order of Lenin Chemicotechnological Inst imeni D. I. Medeleiev

Summary 71, 4 Sep 52, Dissertations Presented for Degrees in Science and Engineering in 1950. From Vechernyaya Moskva, Jan-Dec 1950.

FRADKIN, A. YE.

GINZBURG, David Borisovich, doktor tekhnicheskikh nauk; DELIKISHKIN, Sergey Nikolayevich, kandidat tekhnicheskikh nauk; KHODOROV, Yevgeniy Iosifovich, kandidat tekhnicheskikh nauk; CHIZHSKIY, Anatoliy Fedotovich, kandidat tekhnicheskikh nauk; ZIMIN, V.N., dotsent; retsenzent; KUZYAK, V.A., dotsent, retsenzent; NOKHRATYAN, K.A., kandidat tekhnicheskikh nauk, retsenzent; IVANOV, A.N., dotsent, retsenzent [deceased]; BUDNIKOV, P.P., redaktor; ~~FRADKIN, A. YE.~~ kandidat tekhnicheskikh nauk, nauchnyy redaktor; GOL'DENBERG, L.G., inzhener, nauchnyy redaktor; GLEZAROVA, I.L., redaktor; GLADKIKH, N.N., tekhnicheskiy redaktor

[Furnaces and driers in the silicate industry] Pechi i sushila silikatnoi promyshlennosti. Izd. 2-oe, perer. Pod red. P.P.Budnikova. Moskva, Gos. izd-vo lit-ry po stroit. materialam, 1956. 455 p.

(MIRA 10:3)

1. Deystvitel'nyy chlen Akademii nauk USSR (for Budnikov)
(Kilns) (Clay industries)
(Drying apparatus)

FRADKIN, A.Ye., kandidat tekhnicheskikh nauk.

Study of the tunnel kiln of the "Proletarii" plant. Vest.elektro-
prom. 28 no.2:50-56 P '57. (MLRA 10:3)

1. Gosudarstvennyy issledovatel'skiy elektrokeramicheskiy institut.
(Kilns) (Insulating materials)

Fradkin, A. Ye.

110-3-11/22

AUTHORS: Fradkin, A.Ye. (Cand.Tech.Sci.), Kuznetsova, M.S. (Cand.Tech.Sci.)
& Genin, L.G. (Engineer)

TITLE: Residual stresses in porcelain insulators. (Ostatocnyye napryazheniya v farforovykh izolyatorakh)

PERIODICAL: Vestnik Elektromyshlennosti, 1958, No.2, pp. 37-42. (USSR)

ABSTRACT: Internal stresses in materials are classified into three groups, but the article is concerned only with the first of these, namely, temperature stresses during cooling. It is possible to calculate temperature stresses in metallic bodies of simple shape, but little work of this kind has been done on porcelain. The difference between temporary and residual stresses is explained. The method of determining residual stresses is explained. The method of determining residual stresses in porcelain specimens was adapted from metallurgical methods that have been described in the authors' earlier work. One of these methods is the ring method, which is used to determine the stressed condition of hollow cylinders and rings. External (or internal) layers are successively removed and measurements are made of the changes in the internal (or external) diameter. The internal stresses can be calculated from these changes. The rod method was developed by Prof. N.N. Davidenkov. Here one surface of a rectangular cylinder is ground off in layers. The resulting deformation of the opposite side of the block is measured and the stresses are calculated. Stress diagrams for the specimens are then constructed.

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Residual stresses in porcelain insulators.

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When the porcelain specimens are cooled in the hardening-temperature range at a speed of the order of 450°C per hour, compressive stresses of some 80 kg/cm^2 are set up near the surface and tensile stresses of the order of 40 kg/cm^2 occur near the centre. With slow cooling, at $5 - 10^{\circ}\text{C}$ per hour over the same temperature range, there are practically no residual stresses. When cooling at the rate of 25°C per hour, which is common industrial practice, the tensile stress near the surface of the specimens is about 20 kg/cm^2 . Residual stresses of thermal origin are always compressive near the surface, and the stress diagrams obtained indicate the existence of structural stresses. To establish the temperature interval in which stresses are set up, a number of porcelain rings were made and annealed. They were then subjected to various heat-treatments with different rates of cooling. The results of deformation measurements and the corresponding results of stress calculations are given in Figs. 1 & 2. Internal stress can be completely relieved by treatment at 1100°C , and stresses can be set up again by re-heating and relatively rapid cooling. It was then established that changes in the magnitude and sign of the residual stresses depend on the rate of cooling in the temperature range $800 - 500^{\circ}\text{C}$. The development of tensile stress in certain cases was attributed to structural changes and in particular to modification of quartz. Insulator porcelain contains up to 17%

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Residual stresses in porcelain insulators.

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of free quartz, which is converted from the α to the β form on passing through the temperature of 573°C. Special experiments were undertaken to confirm this hypothesis. The results, given in Fig.3 and Table 2, show that the effect is most marked when the quartz content is high, and is absent when the quartz content is very low. Hence, insulators with no residual stress can be made by appropriate heat-treatment, if the quartz content is kept very low. Another method of reaching low residual stresses is to adapt the heat-treatment to the quartz content. The method by which temperature stresses are set up when porcelain products are cooled, is discussed in some detail. It is considered that residual stresses are unlikely to cause cracks during cooling because they reach their maximum value only when the temperature is uniform throughout the product, i.e. at room temperature. However, they may cause spontaneous cracking during storage, or in service. There are 2 tables, 4 figures, 2 literature references (Russian)

ASSOCIATION: GIEKI.

AVAILABLE: Library of Congress.

Card 3/3

FRADKIN, A.Ye., kand.tekhn.nauk; ROZEN-LYUM, I.S., inzh.

Stabilization and remote control of the consumption of liquid fuel
in industrial furnaces. Trudy GIEKI no.4:93-98 '60. (MIRA 15:1)
(Ceramic industries--Equipment and supplies) (Remote control)

FRADKIN, A.Ye.; KHLOPIN, G.M.

Natural gas kilns in the insulation industry. Gaz.prom. 6 no.8:
15-18 '61. (MIRA 14:10)
(Gas, Natural) (Kilns)

FRADKIN, A. Z.

"Superhigh Frequency Antennas," (book) 647 pp. published by the Publishing House "Sovetskoye Radio" Moskva, 1957.

ZHDANOV, V.S., inzh.; FRADKIN, B.M., inzh.

Further improvement of navigation and power facilities in the
Moscow Canal. Rech.transp. 18 no.10:41-43 0 '59.

(MIRA 13:2)

(Moscow Canal)
(Automatic control)

FRADKIN, B. M., Engineer

Cand. Technical Sci.

"Ferromagnetic Ball in a Magnetic Field and Some Problems of the Theory of Magnetic Dielectrics." Sub 8 Jun 51, Moscow Order of Lenin Power Engineering Inst imeni V. M. Molotov

Dissertations presented for science and engineering degrees in Moscow during 1951.

SO: Sum. No. 480, 9 May 55

FRADKIN, B. N.

PA 197T52

USSR/Engineering - Power Stations

Apr 51

"Measures Against Ground Ice and Floating Ice in Water Channels of Hydroelectric Power Stations," B. M. Fradkin, L. S. Kuskov, Engineers

"Gidrotekh Stroi" No 4, pp 14-16

Describes numerous cases of frosting and clogging with ice of grates in feeding channels of many hydroelec stations during winter of 1950. Concludes that clogging of grates may occur in majority of stations located in the middle part of European USSR and suggests 2 preventive measures:

197T52

USSR/Engineering - Power Stations (Contd) Apr 51

ap devices for heating the grates or removing ice from grates with steam or water under pressure and devices for complete or partial lifting of grates.

197T52

FRADKIN, B. M.

PA 241T92

USSR/Physics - Magnetodielectrics

Jul/Aug 52

"Some Problems of the Theory of Magnetodielectrics,"
B. M. Fradkin, Moscow Power Engr Inst imeni Molotov

"Iz Ak Nauk, Ser Fiz" Vol 16, No 4, pp 481-497

Investigates unsatisfactory interpretation of quasi-statistical theory of magnetodielectrics. Studies their permeability in variable fields and dielectric losses at low frequencies. Indebted to K. M. Polivanov.

241T92

FRADKIN, B.M., kandidat tekhnicheskikh nauk

Ferromagnetic ball in a weak alternating magnetic field. Trudy MEI
no.14:95-121 '53.

(Electromagnetism) (Magnetic fields)

(MLRA 8:7)

FRANKIN, B. M., POLIVANOV, K. M., KATKOV, N. G., SKUGAREV, V. V. (Moscow)

"To the Theory of Artificial Magnetodielectric from Metallic powder,"
paper presented at the International Conference on Physics of Magnetic Phenomena,
Sverdlovsk, USSR, 23-31 May 1956

FRADKIN, B.M.

USSR/Electricity - Dielectrics

G-2

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12115

Author : Lapshin, M.S., Frادkin, B.M.

Inst : -

Title : Measurement of Characteristics of Glass and of Adhesive Films in High Frequency Fields.

Orig Pub : Tr. Mosk. energ. in-ta, 1956, vyp. 18, 172-182

Abstract : Measurements were made of the dielectric constant (ϵ) and the loss angle ($\tan \delta$) of various substances with the aid of the Q-meter KV-1 with the temperature ranging from room temperature to 80 -- 150° and in the frequency range from 1.5 to 24 Mc. Specimens of plate glass, of continuously-rolled glass, of commercial rubber, and also of adhesive film of 18% plastification at a moisture content of 1% were all measured. The investigated substance was introduced between the plates of a capacitor, placed in a thermostatic oven. The capacitor was connected with

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USSR/Electricity - Dielectrics

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Abs Jour : Ref Zhur - Fizika, No 5, 1957, 12115

the Q-meter by means of a coaxial line. Taking two measurements (with and without the specimen), the values of C_x and Q_x were determined from derived formulas. The errors due to disregarding the effect of the coaxial line are calculated.

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Zurn.techn.fis, 26, fasc.5, 1048-1059 (1956) CARD 2 / 2 PA - 1327

upon the sphere, H_1 - the field strength due to polarization of the not re-magnetized domain, H_2 - the field strength due to the polarization of the re-magnetized domain, H_T - the field strength due to eddy currents, H_s - coercitive force. Next, the field strength due to the polarization of matter and the field due to the eddy currents are computed. Now the equation of motion of the wave front of re-magnetization is written down and transformed. The process may begin with a negative value of ΔH and may continue at the expense of the magnetizing effect of the not re-magnetized domain (which, at the beginning of the process comprises the entire sphere). Therefore a supporting exterior field is necessary for the maintenance of a totally magnetized state in a ferromagnetic sphere. The dynamic characteristics of re-magnetization are univocal in the case of arbitrary values of the parameters H_s , J (= magnetization of the matter), γ (= electric conductivity of the matter) and some other parameters. The entire magnetic moment of the sphere consists of the magnetic moment M_1 which is due to eddy currents and the magnetic moment M_2 which is due to the polarization of the material of the sphere. Both moments are computed and discussed.

INSTITUTION: Moscow MEI (probably = Moscow Electrotechnical Institute)

ZHDANOV, V.S., inzh.; FRADKIN, B.M., inzh.; YUDOV, M.F., inzh.

Simplifying the starting circuit for synchronous motors of large
pumping units. Elek. sta. 30 no.3:53-56 Mr '59.

(MIRA 12:5)

(Electric motors, Synchronous) (Pumping machinery)

NEYMAN, Leonid Robertovich; DEMIRCHYAN, Kamo Seropovich; POLIVANOV, K.M.,
prof., retsenzent; FRADKIN, B.M., dots., retsenzent; KUPALYAN,
S.D., dots., retsenzent; PERKOVSKAYA, G.Ye., red.; MURASHOVA,
V.A., tekhn. red.

[Laboratory manual on electromagnetic fields] Rukovodstvo k la-
boratorii elektromagnitnogo polia. Moskva, Gos. izd-vo "Vysshaia
shkola," 1961. 219 p. (MIRA 15:4)

(Electric engineering--Handbooks, manuals, etc.)
(Electric fields) (Magnetic fields)

BC

FRADKIN, B.P.

6-I-2

Vapour-phase treatment of cracked gasoline, in the Vickers cracking unit. B. P. FRADKIN and D. A. STROM (Nef. Chou., 1930, 18, 445-446).—The gasoline vapour is passed through fuller's earth filters at 230-280°. The yield of final gasoline was 91.1%; it had d 0.737, gum 0.3%, and gave satisfactory corrosion and doctor tests. CHEMICAL ABSTRACTS.

ASTM A METALLURGICAL LITERATURE CLASSIFICATION

1930-1939

1940-1949

1950-1959

1960-1969

1970-1979

1980-1989

1990-1999

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2010-2019

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FRADKIN, B.P.

Zadachi Leningradskogo Opytnogo Slantseperegonnogo Zavoda, Goryuchiye Slantsy,
1933, No. 1, 8.

SO: Goryuchiye Slantsy #1934-35, TN .871
G .74

FRANKIN B. P., "TITN" V. A. K.

Tunnel'naya Pech' Dlya Shvelevaniya Slantaa I Probnaya Yeye Eksplokatatsiya
Na Lspz, Goryuchiye Slantsy, 1933, No 6,28

SO:

Goryuchiye Slantsy # 1934-35, TN .871
G .74

CHERNOZUBOV, S.A., inzh.; FRADKIN, B.P., inzh.; PELEVIN, V.M., inzh.

Converting a sand-lime brick plant to the production of
large panels. Stroil. mat. 10 no.6:24-27 Je '64. (MIRA 17:10)

FRADKIN, D. A.

23302 Pperedovyye Metody Reзки Stekla. Steklo i Keramika, 1949, No. 6, c. 13-16

SO: LETOPIS' NO. 31, 1949

FRADKIN, David Arkad'yevich

IREKHOVSKIY, Serafim Maksimovich; FRADKIN, David Arkad'yevich; ISLANKINA,
T.F., redaktor; DMITRIYEVA, R.V., tekhnicheskiiy redaktor.

[Modern techniques in the manufacture of glass] Sovremennaya tekhnika
stekol'nogo proizvodstva. Moskva, Izd-vo "Znanie," 1955. 31 p. (Vse-
soiuznoe obshchestvo po rasprostraneniю politicheskikh i nauchnykh
znaniy, Ser. 4, no.10). (MIRA 8:5)
(Glass manufacture)

FRADKIN, D. A.

USSR/Miscellaneous - Conferences

Card 1/1 Pub. 104 - 11/11

Authors : Fradkin, D. A.

Title : Meeting on the extension of the exploitation and reduction of repair periods for glass furnaces

Periodical : Stek. i ker. 2, 30 - 32, Feb 1955

Abstract : Minutes are presented of the special meeting held in January 1955 at the Gomelsk Glass Plant at which the problems of extending the service life and reducing the repair periods of glass furnaces were discussed.

Institution:

Submitted:

82

AUTHOR: Fradkin, E. A. Cand. Tech. Sci.

TITLE: Study of a Tunnel Kiln at the "Proletariy" Plant
(Issledovaniye tunnel'noy pechi zavoda 'Proletariy')

PERIODICAL: Vestnik Elektropromyshlennost, 1957, No.2.
pp.50-56 (USSR)

ABSTRACT: In the manufacture of ceramics there is a strong tendency to use tunnel kilns which permit the use of conveyors. Three such kilns are installed in different insulator factories in the USSR. The Ceramic Institute in co-operation with the "Proletariy" Plant mastered the firing insulators, types ИП -329 and ИП -257, in a tunnel kiln but the results were not satisfactory because fuel consumption was high and the output low.

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TITLE: Study of a Tunnel Kiln at the "Proletariy" Plant
(Issledovaniye tunnel'noy pechi zavoda 'Proletariy')

This article describes a study of a tunnel kiln at the "Proletariy" Factory made with the object of establishing optimum conditions of operation when firing insulators (mostly type $\text{WT} \sim 35$.)

The oil fired kiln is 121 metres long 2.3 metres wide, 2.175 metres high and will hold 60 loaded cars. The cycle lasts 68 hours so that the throughput is 21 cars per day. The number arrangement, the type of furnaces, and the air circulating system are described.

A long term investigation of the kiln's operation was made under production conditions. Temperature distribution was investigated by placing thermocouples in the cars.

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TITLE: Study of a Tunnel Kiln at the "Proletariy" Plant
(Issledovaniye tunnel'noy pechi zavoda 'Proletariy')

The products of combustion were analysed. The flue gases were analyzed and found to contain excess oxygen. The temperature distribution within the kiln is presented in several graphs.

It was found that in order to obtain high quality products correct gas conditions are even more important than temperature conditions. The CO content should be about 4 - 5% in the reducing zone, and there should be no incomplete combustion products in the oxidising zone. Considerable

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82

TITLE: Study of a Tunnel Kiln at the "Proletariy" Plant
(Issledovaniye tunnel'noy pechi zavoda 'Proletariy')

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temperature variations in the first part of the kiln were caused by air drawn from the inspection to the working channel. Much can be done to improve the temperature distribution by providing a free channel near the bottom and hindering the flow of hot gas around the sides of the cars. As a result of this study the gas and temperature conditions in the furnace were stabilized, and the

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TITLE: Study of a Tunnel Kiln at the "Proletariy" Plant
(Issledovaniye tunnel'noy pechi zavoda 'Proletariy')

furnace has worked for a long time now with only 1.5% of firing rejects. A considerable part of this success is due to stabilization of the fuel supply by the installing PPM type regulators.

The article contains 8 diagrams; there are no literature references.

ASSOCIATION: State Institute of Electroceramics ГИЭКИ
(Gosudarstvennyy elektrokeramicheskiy institut)

PRESENTED BY:

SUBMITTED:

AVAILABLE: Library of Congress

Card 5/5

FRADKIN, E. ^{Y.F.} I. , Master ^(Phys-Math) of Sci — (diss) "Certain problems in the Theory of
Particles With Greater Spins". Leningrad, 1957. 9 pp. (Min of Educ RSFSR,
Leningrad State Pedagog Inst. ^{im} named after A. I. Gertsen. Dept of Theoret. Physics),
(KL, N. 39, 1957, p.94)

AUTHOR

FRADKIN, E.E.

PA - 2686

TITLE

The Particle With Spin 3/2 in the Electromagnetic Field
(Chastitsa so spinom 3/2 v elektromagnitnom pole - Russian)
Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 2, pp 363-365,
(U.S.S.R.)

PERIODICAL

Received 5/1957

Reviewed 6/1957

ABSTRACT

The author investigates in his paper the relativistically invariant equation for a particle with spin 3/2 in an electromagnetic field

$$(\epsilon^k_{\mu\nu} + i\gamma_5) \psi = 0. \quad \pi_k = \partial/\partial x_k - ieA_k \quad (k = 0, 1, 2, 3)$$

The matrices ϵ_k are given in their parametrical form by M. Petras, Chekhosl. fis. zhurn. 5, 160 (1955). The author of the paper under review derives from the above equation additional conditions in relativistically covariant form. After several simplifications, we obtain the following equation of the Schroedinger type: $i \partial \psi / \partial x_0 = H \psi$. H is the Hamilton function of the particle with spin 3/2 in linear approximation with respect to the small parameter $aF_{\mu\nu}$. ($F_{\mu\nu}$ stands for the tensor of the electromagnetic field.). The extraordinary smallness of $aF_{\mu\nu}$ permits us to neglect the share of the higher approximations of $aF_{\mu\nu}$ in the Hamiltonian, and this neglect is permitted even at very strong fields. The Hamilton H is given explicitly. The particle with spin 3/2 has a kinematic dipole moment and a kinematic quadrupole moment. In addition, the Hamiltonian H contains also a specific term of the dipole type. This term depends on the momentum. Because the mean value is ascertained over the charge den-

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The Particle With Spin $3/2$ in the Electromagnetic Field PA - 2686

sity, the normalization condition reads $\int \psi^* \psi (d\vec{r}) = 1$. The mean value of the energy of a particle with spin $3/2$ in the electromagnetic field is expressed by the following formula: $E = \int \psi^* \hat{H} \psi (d\vec{r})$.

Finally the paper gives explicitly also an expression for the energy in linear approximation with respect to the small parameter aF_{nm} . Thus, in addition to the term of the Hamiltonian H_0 of the Dirac type, also the momentum-dependent additional terms of the Dirac type as well as the electrical and magnetical quadrupole moments yield a share in the energy. For reasons of comparison: The particle with spin 0 and $1/2$ have no kinematic moments. The particle with spin 1 has a kinematic dipole moment which yields no direct share in the energy.
(No figures or reproductions).

ASSOCIATION Leningrad State Pedagogic Institute.
PRESENTED BY
SUBMITTED 9.7.1956
AVAILABLE Library of Congress
Card 2/2

FRADKIN, E. E.

56-6-27/56

AUTHOR

FRADKIN, E. E.,

TITLE

ON the RARITA-SCHWINGER-Method in the Theory of Half-Integral-Spin Particles.

(O metode Rarita-Shvingera v teorii chasti s polutselym spinom -Russian)

PERIODICAL

Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 32, Nr 6, pp 1479-1482 (U.S.S.R.)

ABSTRACT

The author here investigates a possible generalization of this method to particles with a higher spin ($s > 3/2$). The present paper shows the following: The density of the Lagrangian as well as the the field equations resulting herefrom and the additional conditions given by P.A.Moldauer and K.M.Case, Phys.Rev.101,279(1956) are applicable only to particles with spin and cannot be extended to particles with a higher spin. The results of this paper, which concern the magnetic moment and the quadrupole moment of the particles may therefore be looked upon as established only for particles with spin $3/2$. At first the density mentioned of the Lagrangian is again written down explicitly. In the case of free particles this function must lead to the DIRAC equations $(\not{\partial} + m)\psi_1 \psi_2 \dots \psi_n = 0$ with the additional conditions $\not{\partial}_\lambda \psi_2 \dots \psi_n = 0, \not{\partial}_\lambda \psi_2 \dots \psi_n = 0$.

The following has to be taken into account for the derivation of equations with a higher spin than $3/2$: The symmetry conditions of the tensor indices $\psi_1 \psi_2 \dots \psi_n$ lead to the fact that the variations $\delta\psi_1 \psi_2 \dots \psi_n$ are not independent. It is especially essential that in

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On the RARITA-SCHWINGER-Method in the Theory of Half-Integral-Spin Particles.

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the case of the variation of L the symmetry of $\psi_1^+ \psi_2 \dots \psi_n$ with respect to the index ϵ is taken into account. The equations resulting from the exact variation for a particle with spin $s = n + (1/2)$ are explicitly written down. Starting with $n = 2$ there exist more equations than unknown quantities and the equations become incompatible. Next, the author investigates the problem of the applicability of the method by RARITA-SCHWINGER to the particles with spin $5/2$. The method by RARITA-SCHWINGER, however, furnishes no positive results for a particle with spin $5/2$. A possible reason for this failure is pointed out. (No illustrations).

ASSOCIATION State Pedagogical Institute, Leningrad.
PRESENTED BY
SUBMITTED 10.10.1956
AVAILABLE Library of Congress.
Card 2/2

~~FRADKIN, E. YE.~~

20-2-12/60

AUTHORS: Fradkin, E. Ye. , Izmaylov, S. V.

TITLE: On the Permissible Transformations of the Equations for Particles With Higher Spins (O dopustimyykh preobrazovaniyakh uravneniy dlya chastits s vysshimi spinami)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 2, pp.277-280 (USSR)

ABSTRACT: The particles with any spins are described by equations of the type $(L^i(\partial/\partial x_i) + i\chi) \Psi(x_0, x_1, x_2, x_3) = 0$. In this connection $\Psi(x_0, x_1, x_2, x_3) = \Psi(ct, x, y, z)$ signifies the wave function which is transformed according to a finitely-dimensional representation of the complete Lorentz group; $L^i (i = 0, 1, 2, 3)$ - quadratic matrices, χ - a real constant different from zero. The invariance of the above-mentioned equation with regard to the just mentioned transformation is guaranteed by the following additional conditions for the matrices L^i :

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On the Permissible Transformations of the Equations for Particles With
Higher Spins

$[L^i I^{jk}] = L^i I^{jk} - I^{jk} L^i = g^{ij} L^k - g^{ik} L^j, (i, j, k = 0, 1, 2, 3);$
 $[L^i T] = 0$. In this connection the I^{jk} signify infinitesimal transformations of the corresponding representation of the specific Lorentz group and T is the transformation corresponding to the reflection $x_0 \rightarrow x_0, x_\alpha \rightarrow -x_\alpha (\alpha = 1, 2, 3)$. At first the authors investigate the possible linear transformation of the wave function $\psi(x_0, x_1, x_2, x_3)$, i.e. transformations of the type $\psi(x_0, x_1, x_2, x_3) = S \psi(x_0, x_1, x_2, x_3)$ which do not change the essential properties of the initially given equations. The form of the S-matrix for the permissible transformations is determined here. To the permissible transformations above all belong the transformations V which do not change the form of I^{jk} and T , i.e. $V^{-1} I^{jk} V = I^{jk}, V^{-1} T V = T, (j, k = 0, 1, 2, 3)$. The matrix A plays an important part. The essential properties of I^{jk}, T, L^i and A do not change in the case of any unitary transformations. The permissible transformations have the general form $S = U_1 V U_2$, where U_1 and U_2 signify any unitary representations and the form of

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On the Permissible Transformations of the Equations for Particles With
Higher Spins

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V is also given. For the particles with higher half-integer spins $s = n + (1/2)$ ($n = 1, 2, \dots, \infty$) only the density of charge of the free particle at rest is an invariant of the permissible transformations. Finally these transformations are more closely investigated for a particle with spin $3/2$. The essential feature of these transformations lies in change of the metrics in the "additional" space with the spin $1/2$. There are 5 references, 1 of which is *Soviet*.

ASSOCIATION: Leningrad State Pedagogical Institute imeni A. I. Gertsen
(Leningradskiy gosudarstvennyy pedagogicheskiy institut im.
A. I. Gertsena)

PRESENTED: December 29, 1956, by V. A. Fok, Academician

SUBMITTED: December 21, 1956

AVAILABLE: Library of Congress

Card 3/3

Fradkin, E. Ye.

20-5-16/54

AUTHOR: Fradkin, E. Ye.

TITLE: The Algebra of the Matrices in the Theory of Particles with Spin $3/2$ (Algebra matrits teorii chastits so spinom $3/2$).

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 5, pp. 907-910 (USSR)

ABSTRACT: The present report determines the most important relations of the algebra of the matrices α^k which occur in the wave equation

$$\left\{ \alpha^k \frac{\partial}{\partial x_k} + i\mathcal{X} \right\} \Psi(x_1, x_1, x_2, x_3)$$

for the particle with the natural spin $3/2$ and positively defined total charge. Here

$$\Psi(x_0, x_1, x_2, x_3) = \Psi(t, x, y, z) \quad \text{denotes the}$$

16-component wave function of the particle with spin $3/2$. The α^k are 16-dimensional square matrices the concrete form of which has already been given in various previous works. \mathcal{X} denotes the mass of the particle. The minimum equation

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20-5-16/54

The Algebra of the Matrices in the Theory of Particles with
Spin $3/2$

for the matrix of the particle with the natural determined spin s has the form

$(L^n)(L^2-1) = 0$. For the particles with spin $1/2, 1, 3/2$ or 2 $n = 2s - 1$ is true. However, the commutator for the particles with spin 0 and 1 resulting from these equations are given. For the particle with spin $3/2$ the exchange relation

$$\sum_p \alpha^i \alpha^k (\alpha^l \alpha^m - g^{lm}) = 0 \quad \text{is obtained. Neither of the}$$

three types of exchange relations with partial symmetrization with respect to two or three indications, nor their linear combination are satisfied by the matrices

α^k . Therefore the general exchange relation is true not only for the matrices α^k of the theory of the particles with spin $3/2$, but also for Dirac's matrices (dirakovskiye matritsy), Duffin-Kemmer matrices (deffin-kemmerovskiye

CARD 2/4

The Algebra of the Matrices in the Theory of Particles with Spin $3/2$ 20-5-16/54

matritsy) β^k , for the matrices of the theory of the particle with the mass \mathcal{Z} and both spin states $3/2$ and $1/2$ as well as for many other matrices. For this reason additional conditions have to be determined for the algebra of the matrices of the particles with spin $3/2$. These relations are here written down explicitly. For the complete construction of the algebra of the matrices of the particle with spin $3/2$ it must therefore be possible to represent the infinitesimal transformations I^k of the wave function ψ in an infinitely small Lorentz transformation by diagonal combinations of the matrices α^k . The transformation T corresponding to the reflection $x^0 \rightarrow x^0, x^i \rightarrow -x^i$ has the form

$$T = (3/4) \{ \alpha^1 \alpha_1 \alpha^0 + \alpha^0 \alpha^1 \alpha_1 - (8/3) \alpha^0 - 4 (\alpha^0)^3 \}, T=1$$

There are 11 references, 5 of which are Slavic.

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The Algebra of the Matrices in the Theory of Particles with Spin $3/2$ 20-5-16/54

ASSOCIATION: Leningrad State Pedagogical Institute imeni A. I. Gertsen
(Leningradskiy gosudarstvennyy pedagogicheskiy institut im.
A. I. Gertsena).

PRESENTED: By V. A. Fok, Academician, April 5, 1957

SUBMITTED: March 27, 1957

AVAILABLE: Library of Congress

CARD 4/4

LALYSHOV, G.M.; SKIDAN, V.B.; FRADKIN, E.Ye.; CHAYKA, M.P.

Resolution of a monochromator with photoelectric recording. Opt.
i spektr. 7 no. 6:780-784 D '59. (MIRA 14:2)
(Monochromators)

SELEN'OV, R.I.; FADKIN, E.Ye.; CHAYKA, N.P.

Apparatus function of a Fabry-Perot spectrometer with a
rectangular orifice plate. Opt. i spektr. 7 no. 6:785-788
D '59. (MIR 14:2)
(Spectrometer)

CHAYKA, M.P.; FADDEEV, E.Ye.

Method for transforming spectral line shapes and its application
to the measurement of the temperature and other parameters of a
light source. Opt. i spektr. 7 no. 6:820-823 D '59.

(MIRA 14:2)

(Spectrometer)

FRADKIN E. Ye.

2i (1)
AUTHORS:

Kaliteyevskiy, N. I., Chayka, M. P.,
Pacheva, I. Kh., Fradkin, E. Ye.

SOV/56-37-3-57/62

TITLE:

Nuclear Moments of the Odd Gadolinium Isotopes

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37,
Nr 3(9), pp 882 - 884 (USSR)

ABSTRACT:

The present "Letter to the Editor" contains an abundance of details partly taken from the authors' own investigations and partly from other publications. In an earlier paper (Ref 1) the hyperfine structure of the 3 lines of Gd I: 5015, 5103, and 5251 Å was investigated by means of a photoelectric spectrometer. The investigations were carried out on the very pure isotopes Gd¹⁵⁵ (97.3%) and Gd¹⁵⁷ (91.4%). Both isotopes have the spin $I = 3/2$. The magnetic moments: $\mu_{155} = -0.32 \pm 0.04$, $\mu_{157} = -0.40 \pm 0.04$. The quadrupole moments: $Q_{155} = 1.6 \cdot 10^{-24} \text{ cm}^2$, $Q_{157} = 2 \cdot 10^{-24} \text{ cm}^2$; these values are nearly double as high as those found by Speck. The internal quadrupole moments $Q_{155}^0 = 8 \cdot 10^{-24} \text{ cm}^2$ and $Q_{157}^0 = 10 \cdot 10^{-24} \text{ cm}^2$ agree as to the order

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Nuclear Moments of the Odd Gadolinium Isotopes

SOV/56-37-3-57/62

of magnitude with those obtained according to the method of the Coulomb excitation of the gadolinium nuclei. The deformation parameters were found to amount to $\delta_{155} = 0.31$ and $\delta_{157} = 0.37$. With respect to the gyromagnetic ratios g_K and g_R (of the internal and collective motions) data, which were obtained from Nilsson's tables, are compared with those obtained by other (Western) authors. Calculations resulted in $g_K 155 = -0.8$ nuclear magnetons and $g_K 157 = -0.9$ nuclear magnetons, $g_R 155 = g_R 157 = 0.7$. The data concerning the g and δ are finally compared with those obtained by Gauvin. The authors thank V. S. Zolotarev for placing the isotopes at their disposal, and L. K. Peker for his advice and discussions. There are 9 references, 2 of which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta (Institute of Physics of Leningrad State University)

SUBMITTED: June 19, 1959

Card 2/2

68308

24.6700

SOV/51-6-1-3/40

AUTHORS:

Kaliteyevskiy, F.I., Chayka, M.P., Pacheva, I.Kh. and Pradkin, E.Ye.

TITLE:

Spectroscopic Determination of Nuclear Moments of Odd Gadolinium Isotopes 19

PERIODICAL: Optika i spektroskopiya, 1960, Vol 8, Nr 1, pp 13-22 (USSR)

ABSTRACT:

The authors investigated photoelectrically the hyperfine structure (h.f.s.) of the 5015.04 Å ($z''G_9--a''F_8^0$), 5103.45 Å ($z'G_8--a''F_7^0$), 5251.18 Å ($z''G_8--a''F_8^0$) lines of separated gadolinium isotopes and natural gadolinium. The purpose of the investigation was to determine the quadrupole moments of Gd^{155} and Gd^{157} and to confirm optically the spin of these nuclei. The authors used a photoelectric spectrometer with a Fabry--Perot interferometer (Refs 7, 8) and a photomultiplier FEU-17 with a good signal-to-noise ratio at low light intensities. The spectrum of gadolinium (used in the form of Gd_2O_3) was excited in an argon-filled discharge tube with a hollow cathode. In order to minimize the Doppler broadening, the hollow cathode was cooled with liquid air and the discharge current was kept below 30 mA (the line-width rose linearly with current, Fig 1). Under such conditions the line width corresponded to that in a gas at 250°K. Even then it was not possible to resolve all the h.f.s.

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Spectroscopic Determination of Nuclear Moments of Odd Gadolinium Isotopes

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components. Gadolinium samples had compositions shown in Table 1: Nr 1 had 97.3% Gd155, Nr 2 had 91.4% Gd157, Nr 3 (natural Gd) had 0.2% Gd152, 2.86% Gd154, 15.61% Gd155, 20.59% Gd156, 16.42% Gd157, 23.45% Gd158, 20.87% Gd160. Some of the results obtained are given in Figs 2 and 3 and in Table 2. Fig 2 shows the relative positions of the h.f.s. components of Gd157 and of Gd160, Gd158 and Gd155 in the case of the 5015 Å line. Fig 3 shows the analysis of the Gd157 5015 Å (a) and 5103 Å (b) lines into their h.f.s. component. Table 2 lists the values of the hyperfine separation \mathcal{H} (in millikaysers) and of calculated and quadrupole moments Q (in 10^{-24}cm^2). Fig 4 shows the transitions of the three lines investigated in schematic form. The authors found that gadolinium lines can be analysed into their components only if four components are assumed for both Gd157 and Gd155. This means that the spin of both these nuclides is $I = 3/2$, in agreement with Low (Ref 5), Manenkov and Prokhorov (Ref 6). Depending on the assumptions made, the authors obtained the following values for the quadrupole moments: either

$$Q_{157} = 1.6 \text{ and } Q_{155} = 1.2 \times 10^{-24} \text{cm}^2,$$

or

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Spectroscopic Determination of Nuclear Moments of Odd Gadolinium Isotopes

$$Q_{157} = 2 \text{ and } Q_{155} = 1.6 \times 10^{-24} \text{ cm}^2.$$

The magnetic moments were also found:

$$\mu_{157} = -0.40 \pm 0.04 \text{ n.m. and } \mu_{155} = -0.32 \pm 0.04 \text{ n.m.}$$

Consequently the moment ratios were:

$$Q_{155}/Q_{157} = 0.8 \pm 0.1, \mu_{155}/\mu_{157} = 0.79 \pm 0.02.$$

The deformation parameters δ of the two nuclides were found to be

$$\delta_{157} = 0.37 \text{ and } \delta_{155} = 0.31, \text{ and their ratio was } \delta_{155}/\delta_{157} = 0.8.$$

The gyromagnetic ratios for the internal (g_K) and the collective (g_R) motion were also determined. They were $g_{K157} = -0.9$, $g_{K155} = -0.8$,

$g_{R157} = g_{R155} = 0.7$; $g_{K155}/g_{K157} = 0.9 \pm 0.1$. Acknowledgments are made to V.S. Zolotarev for supplying separated gadolinium isotopes and to L.K. Peker for his advice. There are 4 figures, 2 tables and 21 references, 5 of which are Soviet, 10 English, 4 German, 1 Swiss and 1 Danish.

Card 3/3

SUBMITTED: June 19, 1959

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S/056/60/032/004/003/048
B004/B070

24.6700

AUTHORS: Kaliteyevskiy, N. I., Fradkin, E. Ye., Chayka, M. P.

TITLE: Quadrupole Moments of Odd Barium Isotopes /9

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,
Vol. 39, No. 4(10), pp. 954-956

TEXT: In order to determine the quadrupole moments of odd barium isotopes, a study of the deviation of the hyperfine structure from the interval rule was made. The structure of $3P_1$ term of both the lines of Ba I: $\lambda = 4599.7 \text{ \AA}$ and $\lambda = 4573.9 \text{ \AA}$ was determined by means of the hyperfine structure of highly enriched separated isotopes Ba¹³⁵ (89.3%) and Ba¹³⁷ (78.8%). Both the isotopes have spin 3/2. Therefore, the structure of the $3P_1$ term is characterized by two independent intervals of the hyperfine structure whose magnitudes are related to the constants A and B of the interval function $W_F = W_J + (1/2)AC + B[C(C+1) - (4/3)I(I+1)J(J+1)]$; $C = F(F+1) - I(I+1) - J(J+1)$; $F = 5/2, 3/2, 1/2$.

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Quadrupole Moments of Odd Barium
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B004/B070

The experimentally observed values of the intervals and the constants A and B are given in a Table. The quadrupole moments were calculated from the constants:

$Q(\text{Ba}^{135}) = (0.25 \pm 0.12) \cdot 10^{-24} \text{ cm}^2$, $Q(\text{Ba}^{137}) = (0.2 \pm 0.1) \cdot 10^{-24} \text{ cm}^2$. Since for both the isotopes $Q > 0$, Ba^{135} as well as Ba^{137} must have a hole in the $2d_{3/2}$ neutron level. The authors thank V. S. Zolotarev for making available the isotopes, L. K. Peker for discussions, and B. A. Strugach for calculations. There are 1 table and 9 references: 4 Soviet, 2 US, 3 German, and 1 Swedish.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: May 12, 1960

Card 2/2

24.6200 1137, 1138, 1139⁵

S/054/61/000/001/003/008
B117/B203

AUTHORS: Kaliteyevskiy, N. I., Chayka, M. P., Fradkin, E. Ye.

TITLE: Application of methods of optical spectroscopy to study
the properties of atomic nuclei

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i
khimii, no. 1, 1961, 25-33

TEXT: The authors studied the possibility of applying the methods of optical spectroscopy to study the properties of atomic nuclei. When checking these methods, they used, above all, the data found by themselves in 1959-60. The relative intensities of hyperfine structural components were measured with a photoelectric spectrometer with a Fabri-Pérot interferometer (Ref. 2: N. I. Kaliteyevskiy, G. M. Malyshev, M. P. Chayka. Optika i spektroskopiya, VI, 820, 1959). The light intensity of this instrument was higher by at least one order of magnitude than that of a monochromator with diffraction grating of equivalent resolving power. The investigation of only 1 mg of Lu_2O_3 , which was

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Application of methods of...

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enriched with Lu¹⁷⁶ up to about 30 %, yielded quite clearly a spin value of $I = 7$. This investigation proved the importance of the optical method for determining the nuclear spin, as well as its suitability as compared with other methods. The same conclusions were drawn when considering results obtained in the measurement of sublevel ranges of hyperfine structure. With sufficient resolving power of the spectrometer, the reading of components with $I > J$ gives a unique spin value. If the resolution of components is limited by the Doppler broadening it is generally possible to disintegrate, with sufficient uniqueness, the contour of the line into a certain number of components at a high signal-to-noise ratio. When determining mechanical nuclear moments, the interference method can, of course, not yet be regarded as perfect. The problem as to the accuracy of the method of determining magnetic and quadrupole moments requires a closer investigation, since direct measurement of these moments is impossible. In experimental determinations of hyperfine structural constants, systematic and random errors are unavoidable. Here, the authors deal with the role of random errors. An analysis of experimental data shows that in the investigation of a well resolved structure the measurement of hyperfine structural ranges is well possible at present

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Application of methods of...

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with an accuracy of $\sim 0.5 \cdot 10^{-3} \text{ cm}^{-1}$. The errors of measurement increase with a worse resolution if it is necessary to disintegrate the contour. Table 3 gives the results of measurement of the hyperfine structure of barium isotopes as an example of such an estimate. All data are given in millikaiser ($1 \text{ mks} = 10^{-3} \text{ cm}^{-1}$). The errors of measurement are shown to be no less than 0.5 %. Approximation methods must be used to calculate absolute values of magnetic moments. For this reason, resonance methods permitting a direct measurement of μ are preferable to the optical method. In those cases where direct methods are not applicable, values of magnetic moments may be calculated both by optical and radiospectroscopic measurement with the same accuracy. When determining quadrupole moments, quantum-mechanical approximation methods are indispensable for all methods basing on the interaction of nucleus and electron shell. When estimating the accuracy of such calculations, the authors made the following statement: In single-electron systems, the entire theoretical calculation error is 5-10 % for magnetic moments, and 15-25 % for quadrupole moments. In each individual case, the admixture of many-electron states can be considered, and $\langle 1/r^3 \rangle$ can be determined from the totality of data. This

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increases the accuracy of determination. For many-electron systems, it is difficult at present to make a numerical estimate of calculation errors which may be different for each individual case. In each case where it is difficult to estimate the errors occurring in the calculation of nuclear moments from the hyperfine structure of the term investigated, it would be convenient to study other terms of the respective isotope. Similar values of moments for several terms of varying configuration give a certain security that errors do not become too high. It can be expected to increase the calculation accuracy by completer joint theoretical and experimental investigations of hyperfine and fine structures of atomic spectra, as well as of gyromagnetic atomic relations. The authors thank B. A. Strugach for making a number of computations. A. A. Manenkov, A. M. Prokhorov, and G. Kopferman are mentioned. There are 6 figures, 4 tables, and 18 references: 8 Soviet-bloc and 10 non-Soviet-bloc.

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Application of methods of...

S/054/61/000/001/003/008
B1.17/B203

Legend to Table 3: Results of measurement of the hyperfine structure of odd barium isotopes. (a) Ranges and constants of hyperfine structure; (b) isotopes.

Интервалы и константы СТС	Изотопы	
	Ba ¹³⁶	Ba ¹³⁷
5/2 → 3/2	83,6 ± 0,6	93,1 ± 0,4
5/2 → 1/2	137,4 ± 0,7	151,5 ± 0,7
A	34,0 ± 0,2	37,7 ± 0,2
B	-1,2 ± 0,6	-0,9 ± 0,5

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S/048/61/025/001/020/031
B029/B060

24.6700

AUTHORS: Kaliteyevskiy, N. I., Chayka, M. P., Pacheva, I. Kh.,
Fradkin, E. Ye.

TITLE: Nuclear moments of odd isotopes of gadolinium

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, v. 25,
no. 1, 1961, 111-114

TEXT: This is a report of studies which have been described in a previous preliminary communication. Several data have now been better defined by additional measurements and by improving the calculation method. The authors used a photoelectric spectrometer and a Fabry - Perot spectrometer to study the hyperfine structure of the three lines of GdI:

$\lambda = 5015 \text{ \AA} (z^{11}G_9 - a^{11}F_8)$; $\lambda = 5103 \text{ \AA} (z^{11}G_9 - a^{11}F_7)$ and

$\lambda = 4743 \text{ \AA} (y^{11}F_3 - a^{11}F_4)$. The measurements were made on separated isotopes of gadolinium with a high-purity degree ($Gd^{155} - 97.3\%$,

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B029/B060

Gd¹⁵⁷ - 91.4%). The components of the fine structure of gadolinium lines are so close to one another (15 to 20 mK) that the fine structure under the given experimental conditions could not be resolved. It can be resolved only if one presupposes four sublevels of the hyperfine structure of the investigated energy levels of Gd¹⁵⁷ and Gd¹⁵⁵. This unequivocally yields for both isotopes the spin 3/2. The position of the components of the hyperfine structure was determined on the basis of the splitting of the line structure taking account of all superimposing isotopes belonging to other elements. The calculations were carried out for the four intensive diagonal components of the line investigated. The three independent intervals $\sigma(1-2)$, $\sigma(1-3)$, $\sigma(1-4)$ were experimentally determined for every line of the two isotopes. The ratio of the magnetic moments of Gd¹⁵⁵ and Gd¹⁵⁷ was established by the direct combination of the experimental data:

$$\frac{\mu_{155}}{\mu_{157}} = \frac{\sigma_{155}(1-2) - \sigma_{155}(1-3) + \sigma_{155}(1-4)}{\sigma_{157}(1-2) - \sigma_{157}(1-3) + \sigma_{157}(1-4)} .$$

The ratio of the quadrupole

moments of Gd¹⁵⁵ and Gd¹⁵⁷ can be calculated with a good accuracy by

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S/048/61/025/001/020/031
B029/B060

Nuclear moments of odd isotopes of...

Casimir's formula. The results of calculations carried out by two different methods are given in Table 1. The value of the ratio of magnetic moments thus found is in good agreement with more recent and more accurate measurements of this quantity by the method of the paramagnetic resonance. The value $Q_{155}/Q_{157} = 0.8 \pm 0.1$ found by the authors contradicts, however, the spectroscopic measurements by O. R. Speck, who found $Q_{155} > Q_{157}$. Therefore, it is of interest to compare the data found by the authors with results obtained by other methods. The most accurate method is evidently that by V. Ramsak et al. (Ref. 10). Like the authors of the present article, those authors also found $Q_{155} < Q_{157}$ but a difference appears in the qualitative evaluation of Q_{155}/Q_{157} . For the calculation of the absolute values of the magnetic moment and the quadrupole moment from spectrometric measurements it is necessary to estimate the matrix elements $\langle H(0) \rangle$ and

$\left\langle \frac{\partial^2 u}{\partial z^2}(0) \right\rangle_J$, which is, however, possible only by approximation. The

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Nuclear moments of odd isotopes of...

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B029/B060

authors found $Q_{155} = 1.45 \cdot 10^{-24} \text{ cm}^2$ and $Q_{157} = 1.8 \cdot 10^{-24} \text{ cm}^2$. The deformation parameters were then estimated from the values of the intrinsic quadrupole moments: $\delta_{155} = 0.27$ and $\delta_{157} = 0.33$. Finally, for the gyromagnetic ratio the authors found $g_{K 155}/g_{K 157} = 0.9$, which is in good agreement with experimental data published by other authors. V. S. Zolotarev is thanked for having supplied the pure isotopes and L. K. Peker for his discussions. The article under consideration is the reproduction of a lecture delivered at the 10th All-Union Conference on Nuclear Spectroscopy, which took place in Moscow from January 19 to 27, 1960. There are 1 figure, 2 tables, and 12 references: 5 Soviet-bloc and 6 non-Soviet-bloc.

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut
Leningradskogo gos. universiteta im. A. A. Zhdanova
(Scientific Research Institute of Physics of Leningrad
State University imeni A. A. Zhdanov)

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Nuclear moments of odd isotopes of...

S/048/61/025/001/020/031
B029/3060

Legend to Table 1: Ratios of magnetic and quadrupole moments of odd gadolinium isotopes

ratio	$\lambda = 5015 \text{ A}$	$\lambda = 5103 \text{ A}$	$\lambda = 5743 \text{ A}$	mean value
μ_{155}	0.80 ± 0.02	0.77 ± 0.01	0.79 ± 0.02	0.78 ± 0.03
μ_{157}				
Q_{155} 1st method	0.76 ± 0.04	0.82 ± 0.02	0.88 ± 0.05	0.8 ± 0.1
Q_{157} 2nd method	0.76 ± 0.03	0.82 ± 0.05	0.86 ± 0.07	0.8 ± 0.1

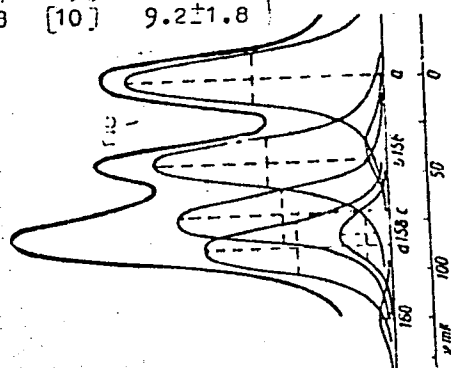
Card 5/6

Nuclear moments of odd isotopes of...

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B029/B060

Legend to Table 2: Values of intrinsic quadrupole moments Q_0 and ratios Q_{0155}/Q_{0157} found by the method of Coulomb excitation.

Q_{0155}	Q_{0157}	$\frac{Q_{0155}}{Q_{0157}}$	Ref.	Q_{0155}	Q_{0157}	$\frac{Q_{0155}}{Q_{0157}}$	Ref.
6.8	6.2	1.1	[8]	6.7 ± 2.4		0.76	[11]
7.6	8.1	0.94	[9]		8.8 ± 1.8	1.04	
6.5	6.6	0.98	[10]	9.2 ± 1.8			



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KALITEYEVSKIY, N.I.; FRADKIN, E.Ye.

Quadrupole moments and isotopic displacements in barium
isotopes. Izv. AN SSSR. Ser. fiz. 25 no.9:1178-1179 '61.
(MIRA 14:8)

1. Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo
gosudarstvennogo universiteta im. A.A.Zhdanova.
(Barium—Isotopes)

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S/051/62/012/006/019/020

E036/E418

AUTHORS: Fradkin, E.Ye., Chayka, M.P.

TITLE: Continuous radiation of a three level quantum generator with an optical pump

PERIODICAL: Optika i spektroskopiya, v.12, no.6, 1962, 796-798

TEXT: T.H.Maiman (Phys. Rev., v.123, 1961, 1145) has solved the steady state equations for a three level quantum generator by using a linear approximation. In the present paper exact solutions are presented, thus taking into account the dependence of the populations N_2 and N_1 of the levels 1 and 2 (Fig.1) on the probability of induced transitions. Expressions are obtained for the difference in population ($N_2 - N_1$) of the two levels and for the radiation power as a function of the pump radiation flux density F . Curves are plotted using data from T.H.Maiman's papers (Phys.Rev., Letters, v.4, 1960, 564; Phys. Rev., v.123, 1961, 1151) on the ruby laser. It is shown that with increasing pump power the radiation power goes to a limiting value. Also as $F \rightarrow \infty$, $(N_2 - N_1)/N_0$ goes to the limit Q_M^0/Q_C where N_0 is the total number of atoms and Q_M^0/Q_C Card 1/2

Continuous radiation ...

S/051/62/012/006/019/020
E036/E418

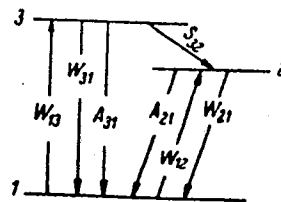
are the "Q's" of the material with all the atoms in the ground state and of the cavity respectively. This is stated to be equivalent to the usual condition for generation in the linear approximation. It is concluded that saturation through $(N_2 - N_1)$ is achieved at small pump powers significantly sooner than saturation by generated power and the limiting condition for $(N_2 - N_1)$ is fulfilled over the whole range of generation. There are 2 figures.

SUBMITTED: January 17, 1962

Fig.1. The three level diagram.

$W_{12}, W_{13}, W_{21}, W_{31}$ - induced transition probabilities.
 S_{32} - transition probability for non-radiative transitions.
 A_{21}, A_{31} - transition probabilities for spontaneous transitions.

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S/056/62/042/003/024/049
B102/B138

AUTHOR: Fradkin, E. Ye.

TITLE: The isotopic shift of spectral lines and the compressibility of deformed nuclei

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 3, 1962, 787 - 798

TEXT: Simple formulas are derived for the constant of isotopic shift, in which C depends only on the root-mean-square nuclear radius and its relative change in the series of isotopes. For the isotopic shift of an ns electron, $\delta T_{ns} = A^2 Z n^{-3} C \text{ cm}^{-1}$, in second approximation the constant C is obtained as.

$$C_{\text{теор}} = \frac{R_{\infty}}{3} \left(\frac{1+\sigma}{\Gamma(1+2\sigma)} \right)^2 \left(\frac{2Z \langle R^2 \rangle^{1/2}}{a_H} \right)^{2\sigma} f(n, y, Z) \frac{\delta \langle R^2 \rangle}{\langle R^2 \rangle}, \quad (13)$$

with

$$f(n, y, Z) = \left(1 - \frac{1-\sigma}{1+\sigma} \frac{\alpha Z + (1+\sigma)K(y)}{\alpha Z + (1-\sigma)K(y)} \right)^2 y^{2(1-\sigma)} [1 - P(n, y)],$$

Card 1/4 $\sigma = \sqrt{1 - (\alpha Z)^2}$,

The isotopic shift ...

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$$K(R_0) \equiv K(y) = -\alpha Z \left(\frac{1}{2} + \frac{1}{6} (\alpha Z)^2 - \frac{1}{6} y^2 [1 - (\alpha Z)^2 P_0(n, y)] \right),$$

$$P_0(n, y) = \frac{2}{3} \frac{(n+3)(n+1)^2}{n^3} \left[\frac{1}{5} - \frac{n+9}{(n+1)(n+3)(n+5)} + \frac{3(2n+9)}{(n+1)^2(n+3)^2(2n+5)} - \frac{9}{(n+1)^2(n+3)^2(3n+5)} \right] - \quad (9a) \text{ and}$$

$$-\frac{3}{4} \frac{n+3}{n+1} + \frac{1}{12} \frac{n+1}{n+3} + \frac{1}{2} \ln \frac{n+3}{n+1} + \ln y - \frac{1}{12} y^2.$$

$$P(n, y) = (\alpha Z)^2 (P_1(n) - P_4(y)) + \alpha Z (1 + \epsilon) \langle R^2 \rangle^{1/2} (P_3(n) - P_4(y)),$$

$$P_2(y) = \frac{1}{6} y^2 - \ln y,$$

$$P_4(y) = \frac{1}{3} y + \frac{1}{y},$$

$$y = \frac{\langle R^2 \rangle^{1/2}}{R_0} = \sqrt{\frac{n+1}{n+3}} \frac{R}{R_0} \leq \sqrt{\frac{n+1}{n+3}}.$$

$P_1(n)$ and $P_3(n)$ are voluminous functions of n ; $\alpha = e^2/\hbar c$. In the range $Z \leq 80$, $f(Z) \approx 1$ with an error $\leq 3.5\%$, so that

$$C_{\text{theor}} = \frac{R_m}{3} \left(\frac{1 + \sigma}{1 + 2\sigma} \right)^2 \left(\frac{2Z \langle R^2 \rangle^{1/2}}{a_H} \right)^{2\sigma} \frac{\langle R^2 \rangle}{\langle R^2 \rangle}$$

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B102/B138

The isotopic shift ...

If the compressibility of the deformed nuclei is taken into account,

$$C_{\text{reop}} = \frac{2}{3} R_{\infty} \left(\frac{3}{5}\right)^2 \left(\frac{1+\sigma}{1+(1+2\sigma)}\right)^2 \left(\frac{2ZR_{03KB}}{a_{11}}\right)^{2\sigma} L(\beta, \gamma), \quad (19)$$

$$L(\beta, \gamma) = \left[1 + \left(\frac{5}{4\pi} + \xi\right) \left(\frac{\beta_1 + \beta_2}{2}\right)^2\right] \frac{\delta R_{03KB}}{R_{03KB}} + \frac{5}{8\pi} [(1 + 0.8\pi\xi) \times \\ \times (\beta_1^2 - \beta_2^2) + 0.3(\beta_1^2 f(\gamma_1) - \beta_2^2 f(\gamma_2))]. \quad (20).$$

For spherical nuclei $L = R_{\text{oequ}}/R_{\text{oequ}}$. The relative variation of the equivalent nuclear radius when the number of neutrons is changed, is given by

$$\frac{\delta R_{03KB}}{R_{03KB}} = \frac{\delta N}{R_{03KB}} \frac{\delta R_{03KB}}{\delta N} = \frac{\delta N}{R_{03KB}} \frac{\delta R_{03KB}}{\delta A} \eta = \frac{\delta A}{3A} \eta \zeta,$$

$$\eta = \frac{\delta R_{03KB}}{\delta N} / \frac{\delta R_{03KB}}{\delta A}, \quad \zeta = \frac{3A}{R_{03KB}} \frac{dR_{03KB}}{dA}. \quad (21).$$

For an incompressible nucleus $\eta = \xi = 1$. By using the Fermi model for $125 < A < 218$ $\xi = 0.88 \pm 0.02$. The coefficients of regular compressibility

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The isotopic shift ...

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B102/B138

η and deformation compressibility can be obtained by comparing C_{theor} and C_{exp}

$$C_{\text{exp}} = \frac{\delta T_s}{\alpha(n') a_s / G}.$$

$$\alpha(n') = \frac{A^2}{H} = \frac{3}{2} \frac{\Gamma(n' + 2s + 1)}{\Gamma(n' + 1)(1 + s)^2} \frac{(N + n' + s)(N + 1 - n')^2}{[N + 2(n' + s)](N + 1)N^{2s-1}}. \quad (24a).$$

Numerical calculations and comparisons show that best agreement is obtained with $\eta = 0.7$ and $\xi = -5/8\pi$. Professor N. I. Kaliteyevskiy and M. P. Chayka are thanked for their interest and Professor Ya. A. Smorodinskiy, Yu. P. Dontsov, and D. P. Grechukhin for discussions. There are 4 tables and 29 references: 7 Soviet and 22 non-Soviet. The four most recent references to English-language publications read as follows: P. Sanders, G. Woodgate. Proc. Roy. Soc. A257, 269, 1960; O. Hansen et al. Nucl. Phys. 25, 634, 1961; A. R. Bodmer. Nucl. Phys. 2, 37, 1959. B. Elbeck et al. Nucl. Phys. 19, 593, 1960.

SUBMITTED: July 10, 1961

Card 4/4

L 54773-65

ACCESSION NR: AT5013924

UR/0000/64/000/000/0021/0022

AUTHOR: Buldyrev, V. S.; Fradkin, E. Ye.

TITLE: Some problems of the open resonator theory

SOURCE: Vsesoyuznyy simpozium po difraktsii voln. 3rd. Tbilisi, 1964. Referaty dokladov. Moscow, 1964, 21-22

TOPIC TAGS: open resonator theory, resonator wave separation, open resonator scalar problem, resonator wave number spectrum, spherical mirror open resonator

ABSTRACT: This note reports briefly that the paper contributed to the symposium: (1) discussed the boundary problem related to the electromagnetic field in an open resonator with a source within the resonator, Leontovich boundary conditions at the resonator's mirrors, and radiation conditions at infinity. The authors showed for which resonator geometry one can separate the TM from the TE waves and established the inhomogeneous scalar problems for the corresponding Hertz vector components under Sommerfeld radiation and appropriate boundary conditions. This all resulted in an approximate system of two inhomogeneous integral equations for the distribution of the field over the interior surfaces of mirror-resonators. The corresponding homogeneous system may be called the open resonator system of integral equations.

Card 1/2

L. 54778-55

ACCESSION NR: AT5013924

$$2\pi u_j(N_j) = \sum_{i=1}^2 \int_{S_j} \left(ik_{ij} \frac{e^{ik_{ij}R_{ij}}}{R_{ij}} - \frac{\partial}{\partial n} \frac{e^{ik_{ij}R_{ij}}}{R_{ij}} \right) u_i(N_i) dS \quad (j=1,2), \quad (1)$$

For ideal mirrors and with certain approximations, Equation (1) coincides with the integral equations of Fox and Lee. (2) The paper further showed how one can obtain the spectrum of the complex values of wave numbers from the spectrum of eigenvalues of (1); and (3) discussed the integral equations of open optical resonators with spherical mirrors in the Fox and Lee approximation. The combination of geometric parameters determining the complex eigenvalues was established from the symmetry properties of these equations. The diffraction loss numbers determining the diffraction losses for best Q-factor types of resonator configurations are estimated for certain types of resonators. (Orig. art. has: 3 formulas.)

ASSOCIATION: none

SUBMITTED: 09Sep64

ENCL: 00

SUB CODE: OP

NO REF SOV: 000

OTHER: 000

Card 2/2

L 13650-65 EWA(k)/EWT(1)/EEC(k)-2/T/EEC(b)-2/EWP(k)/EWA(m)-2 Po-4/Pf-4/
 PI-4 IJP(c)/ASD(d)/BSD/AFWL/SSD/AFETR/ASD(a)-5/RAEM(a)/ESD(dp)/ESD(gs)/ESD(t)
 ACCESSION NR: AP4047179 JHB/WG S/0051/64/017/004/0583/0596

AUTHORS: Buldy*rev, V. S.; Fradkin, E. Ye.

TITLE: Integral equations of open cavities ²¹ B

SOURCE: Optika i spektroskopiya, v. 17, no. 4, 1964, 583-596

TOPIC TAGS: laser, iraser, laser cavity, confocal cavity, open cavity

ABSTRACT: In contrast to the equations derived by A. G. Fox and T. Li (Bell System Techn. J. v. 40, 453, 1961) on the basis of the Fresnel principle, which is not directly connected with the electromagnetic field distribution, the authors start from Maxwell's equations and the Leontovich boundary conditions and obtain the integral equations for the distribution of two independent components of the Hertz vector on the reflecting surface of open cavities used in optical and infrared lasers. By separating the corresponding boundary

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L 13650-65

ACCESSION NR: AP4047179

conditions, it is shown that the TM and TE modes can exist independently in the cavity, so that incidence of one mode cannot give rise to the other. The integral equations for the optical laser are then obtained by superposition, and it is shown that the results of Fox and Li are valid only in the case of an ideal cavity (perfectly reflecting identical mirrors). A method for obtaining the natural frequencies and Q-values of the open cavity is also presented. A confocal cylindrical cavity is analyzed by way of an example. "The author thanks A. M. Prokhorov, at whose advice he considered the cylindrical confocal cavity, for a useful discussion." Orig. art. has: 6 figures and 33 formulas.

ASSOCIATION: None

SUBMITTED: 02Jul63

ENCL: 00

SUB CODE: EC, MA

NR REF SOV: 005

OTHER: 005

Card 2/2

ACC NR: AP6002293	SOURCE CODE: UR/0141/65/008/006/1089/1099
AUTHOR: Boykova, R. F.; Fradkin, E. Ye.	33
ORG: Leningrad State University (Leningradskiy gosudarstvennyy universitet)	B
TITLE: Propagation of strong monochromatic radiation in media having different types of spectral-line broadening	
SOURCE: IVUZ. Radiofizika, v. 8, no. 6, 1965, 1089-1099	
TOPIC TAGS: monochromatic radiation, dielectric property	
ABSTRACT: Propagation of stationary monochromatic radiation in a semi-infinite dielectric is considered theoretically. Equations describing a nonlinear law of absorption (or amplification) in the dielectric are set up, as well as a formula for macroscopic polarizability of a molecule. The polarizability of the dielectric medium with uniform and nonuniform spectral-line broadening is explored. Differential and integral absorption laws are formulated for several types of spectral-line broadening. It was found that: 1) Nonlinear effects increase the range of light penetration as compared to that estimated from the Buger law; 2) nonuniform spectral-line broadening reduces the role of nonlinear effects in the absorption as compared to the case of uniform broadening for the same values of parameter βS_0 (nonlinearity parameter and intensity of radiation); 3) absorption falls off and the light penetration range increases with the increasing mismatch $\Delta \tilde{\omega}$. Orig.art. has: 3 figures and 50 formulas.	[03]
SUB CODE: 20 / SUBM DATE: 08May65 / ORIG REF: 009 / OTH REF: 002 / ATD PRESS: 4181	
Card 1/1 HW	UDC: 621.371.132

L 64006-65 EWA(k)/FBD/ENT(1)/EEC(k)-2/T/EEC(b)-2/RAP(k)/EWA(m)-2/EWA(R) SCTS/IJP(C)
ACCESSION NR: AP501976C

UR/0051/65/019/002/0255/0263 WG
621.375.9:53

AUTHOR: Zeyger, S. G.⁴⁴; Kaliteyevskiy, N. I.⁴⁴; Fradkin, E. Ye.⁴⁴; Chayka, M. P.⁴⁴ 42

TITLE: The structure of the radiation field of a gas laser with spherical mirrors

SOURCE: Optika i spektroskopiya, v. 19, no. 2, 1965, 255-263 ^{25,44}

TOPIC TAGS: laser output, gas laser, spherical mirror laser

ABSTRACT: The intensity distribution of a gas laser with spherical mirrors with a high coefficient of reflection was studied experimentally and theoretically. The dependence of the size of the laser beam on the distance from the resonator center and/or the focusing lens was plotted. The amount of emitted energy which can be focused into a given angle by means of two simple lenses was found to be higher than can be achieved with equal distribution of the intensity of the front of the beam. Orig. art. has: 6 figures and 21 formulas. [YK]

ASSOCIATION: none

SUBMITTED: 19Sep64

NO REP SOV: 002

Card 1/1 *lll*

ENCL: 00
OTHER: 002

SUB CODE: EC
ATD PRESS: 4057

L 11815-66 EWT(m)/EWP(t)/EWP(b) LJP(c) JD

ACC NR: AP6001632

SOURCE CODE: UR/0051/65/019/006/0843/0850

AUTHORS: Boykova, R. F.; Fradkin, E. Ye.

ORG: None

45
44
B

TITLE: Calculation of the cross section of electronic excitation of energy levels of inert gases

SOURCE: Optika i spektroskopiya, v. 19, no. 6, 1965, 843-850

TOPIC TAGS: laser theory, optic transition, wave function, excitation cross section

ABSTRACT: A procedure is proposed for calculating the excitation cross sections of individual energy levels of inert gases, using the Born-Oppenheimer method with atomic functions in the total angular momentum representation. These calculations are of interest in connection with contemporary experiments on the production or inverse populations in gas lasers. The theoretical formulas are derived and the numerical calculations are made for the excitation of the 3p level configuration of neon from the ground state. Plots and tables of the results are presented. The results lead to the following conclusions: 1) the cross sections for the excitation of a group of closely lying energy levels

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UDC: 539.186.2.001.1

L 11815-66

ACC NR: AP6001632

of one electronic configuration can differ in magnitude and in the energy dependence to a considerable degree. 2) Since the atomic wave functions are usually calculated in the central-field approximation, the type of the vector coupling of the corresponding state of the atom must be taken into account in calculating the excitation cross sections of each individual level. 3) To obtain consistent results by the Born and by the Born-Oppenheimer methods, it is necessary to employ good wave functions. Authors thank V. I. Ochkur for interest in the work and for discussions. Orig. art. has: 2 figures and 1 table and 15 formulas. [02]

SUB CODE: 20/ SUBM DATE: 01Jul64/ ORIG REF: 005/ OTH REF: 006/
 ATD PRESS: 4/82

bel
 Cord 2/2

L 06258-67 EWI(1)

ACC NR: AP6030963

SOURCE CODE: UR/0181/66/008/009/2655/2659

AUTHOR: Zeyger, S. G.; Fradkin, E. Ye.

33

ORG: Leningrad State University im. A. A. Zhdanov (Leningradskiy gosudarstvennyy universitet) *B*

TITLE: Number of generating modes in solid-state optical quantum generators of moving and standing waves

25

SOURCE: Fizika tverdogo tela, v. 8, no. 9, 1966, 2655-2659

TOPIC TAGS: standing wave, quantum generator

ABSTRACT: It has been shown earlier that the characteristic features of amplification and generation substantially depend on the type of broadening of the amplification contour of the active medium. The present article analyzes the manner in which the type of broadening affects the number of modes generating in a solid-state optical generator. It is shown that two modes with frequencies ω_1, ω_2 can generate if their frequency difference $|\omega_1 - \omega_2|$ is sufficiently large, $|\omega_1 - \omega_2| \geq |\omega_1 - \omega_2|_0$, and that the ratio of limiting frequency intervals in the generator of a moving wave and in the generator of a standing wave depends on the type of broadening of the amplification contour. Orig. art. has: 1 table and 5 formulas.

SUB CODE: *09/* 20/ SUBM DATE: 27Jan66/ ORIG REF: 005/ OTH REF: 003

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L 17983-66 FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(h) IJP(c) WG
ACC NR: AP6007004 SOURCE CODE: UR/0051/66/020/002/0316/0323

AUTHOR: Fradkin, E. Ye.

ORG: none

TITLE: Open asymmetric spherical resonators for a laser [paper presented at the
Third All-Union Symposium on Wave Diffraction held in Tbilisi in September 1963]

SOURCE: Optika i spektroskopiya, v. 20, no. 2, 1966, 316-323

TOPIC TAGS: laser optics, resonator, laser theory

ABSTRACT: The authors consider the symmetry properties of an integral equation for an open optical resonator consisting of two ideal spherical mirrors (coefficient of reflection equal to unity) with a rectangular aperture. It is shown that the resonance frequencies and diffraction losses depend on only three combinations of five geometric parameters of the resonator: the mirror radii R_1 and R_2 , the transverse dimensions of the mirrors a_1 and a_2 , and the distance between the mirrors $2L$. An approximate analysis of the geometric optics of the system is used as a basis for finding the fourth property of symmetry of the integral equation for the resonator,

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UDC: 621.375.9 : 535.001.1

L 17983-66

ACC NR: AP6007004

dividing the g-space of the resonators into a region without diffraction losses and a region with high diffraction losses, and finding the eigenfunctions and frequency spectrum for resonators in the region without diffraction losses. "The author is grateful to V. S. Buldyrev for useful discussion of the results of this work." Orig. art. has: 3 figures, 14 formulas. [14]

SUB CODE: 20/ SUBM DATE: 23Oct64/ ORIG REF: 006/ OTH REF: 005/ ATD PRESS:

4213

Card 2/2 *gc*

L 17984-66 FBD/EWT(1)/EEC(k)-2/T/ENP(k)/EWA(h) IJP(c) WG
ACC NR: AP6007005 SOURCE CODE: UR/0051/66/020/002/0324/0326

AUTHOR: Kuryatov, V. N.; Fradkin, E. Ye.

ORG: none

TITLE: Effect of the resonator configuration on the emission power of a laser

SOURCE: Optika i spektroskopiya, v. 20, no. 2, 1966, 324-326

TOPIC TAGS: laser optics, gas laser, laser emission

ABSTRACT: The authors study the effect which the shape and relative location of the mirrors in a gas laser have on the emission power. A helium-neon laser with external mirrors operating on a wavelength of 1.15μ was used. The internal diameter of the cell was 15 mm and the length of the resonator could be changed from 89 to 300 cm by moving one of the mirrors. Three series of experiments were conducted. In the first series, the emission power was measured as a function of the distance between the mirrors for a resonator with one plane and one spherical mirror in which a single maximum was observed at a distance between mirrors corresponding to the focal length. In the second series of experiments, two spherical mirrors were used

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UDC: 621.375.9 : 535

L 17984-66

ACC NR: AP6007005

with differing radii of curvature: 2.021 m and 6.650 m. A single emission maximum was observed at a mirror distance of 1.37 m. In the third series, two spherical mirrors with identical radii of curvature were used and emission maxima were observed at intermirror distances equal to the radius of curvature or to half the radius of curvature. A wide maximum was also observed at approximately 0.7 times the radius of curvature. The following factors are considered with regard to their effect on variation in the emission power of the laser: 1. a change in diffraction losses; 2. a change in the spectrum of the emission frequencies; 3. a change in the spatial distribution of the field within the resonator. "The authors are grateful to N. I. Kaliteyevskiy and M. P. Chayka for stimulating discussions." Orig. art. has: 2 figures, 2 formulas. [14]

SUB CODE: 20/ SUBM DATE: 23Oct64/ ORIG REF: 001/ OTH REF: 005/ ATD PRESS:

4213

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L 10418-07 INT(1)/INT(2)-2/INT(2) IJP(c) - W3

ACC NR: AP0031963

SOURCE CODE: UR/0051/66/021/003/0386/0390

AUTHOR: Zeyger, S. G.; Pradkin, E. Ye. 31

ORG: none

TITLE: Two-mode competition in a traveling-wave laser ✓

SOURCE: Optika i spektroskopiya, v. 21, no. 3, 1966, 386-390

TOPIC TAGS: laser theory, traveling wave, laser, resonator mode, *PERTURBATION THEORY*

ABSTRACT: The paper was presented at the First All-Union Symposium on Nonlinear Optics, held in June 1965 in Minsk. Analysis of equations for two traveling waves in an active medium (consisting of a system of atoms with a Gaussian velocity distribution) was done using methods of the theory of perturbations. Two special cases, uniform and nonuniform broadening, are discussed and expressions are derived for the frequency and relaxation times. Orig. art. has: 16 formulas. [YK]

SUB CODE: 20 / SUBM DATE: 15Sep65/ ORIG REF: 001/ OTH REF: 005

Card 1/1

UDC: 621.375.9:536.001.1

VOLKOVETS, N., slesar'-sborshchik (st. Berngardovka, Leningradskaya oblast'); PAVASAR, B., plotnik (st. Simskaya, Chelyabinskaya oblast'); ADIBEKYAN, O., inzh. (Yerevan); ROGOZIN, T. (Odessa); FRADKIN, F., inzhener-mekhanik (Moskva); SEMENENKO, P., mekhanik; RADCHENKO, P., inzh.

Readers' letter exchange. Tekh.mol. 30 no.10:22-23 '62.

(MIRA 15:12)

1. Kolkhoz imeni Tel'mana, Turkmenskaya SSR (for Semenenko).
(Technological innovations)

FRADKIN, F.

Mechanized development. Sov.foto 22 no.10:35 0 '62.

(MIRA 15:11)

(Motion-picture photography--Developing and developers)

FRADKIN, F.R.

Provide the protection filters with sections. Avtom., telem. 1
svias' 3 no.2:32 F '59. (MIRA 12:4)

1. Azmestitel' nachal'nika Deminskoy distantzii signalizatsii i
svyazi Ufimskoy dorogi.
(Electric filters)

5. PUGHOV, P.R., inzh., FRADKIN, P.R., inzh.

Signalization system using telephone communication lines.
Mokh. i avtom. proizv. 18 no.4:47-48 Ap'01. (MIRA 17:5)

IOFFE, M. S., MAKOV, B. N., BREZHNEV, B. G., FRADKIN, G. M. and MOROSOV, P. M.

"An Ion Source for Stable Isotope Separation."

paper to be presented at 2nd UN Intl.' Conf. on the peaceful uses of Atomic Energy, Geneva, 1 - 13, Sept 58.

FRADKIN, G. M.

PHASE I BOOK EXPLOITATION

SOV/4536

Tashkentskaya konferentsiya po mirnomu ispol'zovaniyu atomnoy energii. Tashkent, 1959

Tezisy dokladov (Outlines of Reports of the Tashkent Conference on the Peaceful Uses of Atomic Energy) Tashkent, Izd-vo AN Uzbekskoy SSR, 1959. 229 p.
2,000 copies printed.

Sponsoring Agencies: Akademiya nauk Uzbekskoy SSR; Nauchno-tekhnicheskiy komitet Soveta Ministrov UzSSR.

Resp. Ed. for this book: L.G. Gurvich; Ed. of Publishing House: I. G. Gaysinskaya;
Tech. Ed.: V. P. Bartseva.

PURPOSE: This book is intended for nuclear physicists and other members of the scientific community interested in recent progress in the peaceful uses of atomic energy.

COVERAGE: This collection of abstracts of reports and papers read at the Tashkent Conference on the Peaceful Uses of Atomic Energy reports on research on a number of theoretical problems in nuclear and radiation physics, practical problems

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Outlines of Reports of the Tashkent Conference (Cont.)

SOV/4586

and methods in the preparation of radioactive isotopes, and the application of isotopes in industry, geology, agriculture, medicine, plant and animal biology, and other branches of the national economy and scientific research. The Table of Contents has been expanded to include authors and titles of abstracted papers appearing in section headings "Plenary Sessions" through "Radioactive Isotopes and Nuclear Radiations in Chemistry". No personalities are mentioned. There are no references.

TABLE OF CONTENTS:

Plenary Sessions

[Arifov, U. A., Institut yadernoy fiziki AN UzSSR (Institute of Nuclear Physics AS Uzbekskaya SSR), Perspectives for the Development of Scientific Research at the Institute of Nuclear Physics AS Uzbek SSR]

5

[Kulish, Ye. Ye., and G. M. Fradkin, Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for Utilization of Atomic Energy of the Council of Ministers of the USSR). Production of Radioactive Isotopes in the Soviet Union]

6

~~card 2/28~~

GRABLEVSKIY, V.N.; KULISH, Ye.Ye.; MATYUSHINA, N.A.; POPOVA, G.I.;
POTAPOV, S.P.; SAVITSKIY, P.S.; TEREKHOVA, V.N.; FRADKIN, G.M.;
LABAZNOV, V.I., red.; VLASOVA, N.A., tekhn.red.

[Isotopes, radiation sources, and radioactive materials; a
catalog] Izotopy, istochniki izlucheniia i radioaktivnye
materialy; katalog. Sost. avtorskim kollektivom: V.N.Grablev-
skii i dr. Moskva, Izd-vo Glav.uprav.po ispol'zovaniiu atomnoi
energii pri Sovete Ministrov SSSR, 1959. 269 p. (MIRA 12:12)

1. Russia (1923- U.S.S.R.) Glavnoye upravleniye po ispol'zova-
niyu atomnoy energii.
(Radioactive substances)

33081

S/638/61/001/000/003/056
B102/B138

21.400

AUTHORS: Kulish, Ye. Ye., Fradkin, G. M.

TITLE: Production of radioisotopes in the USSR

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu
atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent,
1961, 34-46

TEXT: The authors give a survey of the most important details of Soviet isotope production, which has greatly increased in the last few years. Standard T'Y (TU) specifications have also been laid down for isotope production. During the last two years the production processes for 40 new isotopes and about 200 new labelled compounds have been developed. Most of the isotopes are produced as results of (n, γ) reactions. High-purity radioisotopes are either obtained by irradiating high-purity stable isotopes or by choosing reactions in which the target is a different element from the isotope produced. The latter method has become very popular since the fast reactor has been started up, as this made (n,p), (n, α) and (n,2n) reactions possible. New isotopes are also obtained from

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Production of radioisotopes ...

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the decay of isotopes produced by (n,γ) , by (T,n) and $(T,2n)$ reactions and from uranium fission fragments

(Pm^{147} , Cs^{137} , Sr^{90} etc). They can be separated in the pure state. The new labelled compounds include a large number of complex compounds such as glycerin, glyceric acid, and benzyl alcohol which are important in biochemistry, and pharmaceutical products labelled with C^{14} . Besides the conventional chemical methods of producing labelled compounds increasing use is made of the energy of the recoil nuclei, and the method of isotope exchange is also employed. The activities and dimensions of the Eu^{152} , Co^{60} , S^{75} , Tu^{170} , R^{226} , C^{144} , Eu^{155} , and Cs^{137} preparations commercially produced since 1959 are tabulated. 95% of the annual consumption of $5 \cdot 10^5$ curies consists of α -, β -, γ - and n-emitters. Production of the latter, which have become important in mining and well drilling, has been particularly accelerated just recently. Besides Po-Be, Ra-Be sources are also used, which are produced with different dimensions and with certain maximum intensities between $1 \cdot 10^4$ and $3 \cdot 10^7$ n/sec. The prices of the most important isotope preparations are given. To standardize activity measurements comparative measurements with standard apparatus

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B102/B138

Production of radioisotopes ...

are suggested. Of the short-lived isotopes ($t_{1/2} < 3$ d) 52 different compounds of 42 isotopes are being produced at present. The most important are Na^{24} , Si^{31} , K^{42} , Cu^{64} , Br^{32} , Au^{198} , J^{131} , and P^{32} . The starting materials are the chemically or analytically pure reagents. Special laboratories are needed to produce preparations of short-lived isotopes. A project for such a laboratory, produced by the Moskovskiy proyektnyy institut (Moscow Planning Institute), is obtained. There are 1 figure and 5 tables.

ASSOCIATION: Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for the Utilization of Atomic Energy at the Council of Ministers of the USSR)

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